What is claimed is:

1. A transparent conductive oxide film comprising a doped metal oxide, wherein the ionic size of at least one dopant in the doped metal oxide approximates the size of the host ions in an oxide lattice in the doped metal oxide.

2. The transparent conductive oxide film as claimed in claim 1, wherein the ionic size of said dopant is between approximately 0.6Å and 0.8Å.

3. The transparent conductive oxide film as claimed in claim 2, wherein said metal oxide is selected from the group consisting of $Zn^{2+}O$, $Sn^{4+}O_2$, $Ge^{4+}O_2$, $Zr^{4+}O_2$, $Ti^{4+}O_2$, $Ga^{3+}{}_2O_3$, and mixtures thereof, and wherein said at least one dopant is selected from the group consisting of Sn^{4+}, Bi^{5+}, Ta^{5+}, Hf^{4+}, Mo^{6+}, Te^{6+}, Nb^{5+}, and mixtures thereof.

4. A coated substrate comprising a substrate having directly coated thereon the transparent conductive oxide of claim 1.

5. A transparent conductive oxide film comprising a rutile metal oxide MO_2, wherein M is selected from the group consisting of Ti, V, Cr, Mo, Ru, and mixtures thereof.

6. The transparent conductive oxide film as claimed in claim 5, further comprising at least one MO_2 film layer, wherein said MO_2 film layer comprises SnO_2 or other metal oxide capable of stabilizing the rutile MO_2 film.

7. The transparent conductive oxide film as claimed in claim 6, comprising a sandwich structure of $M'O_2/M''O_2/M''O_2$ wherein M', M'' and M''' are the same or different.

8. The transparent conductive oxide film as claimed in claim 5, wherein said metal oxide is $Sn_xM_{1-x}O_2$, where M is selected from the group consisting of Ti, V, Cr, Mo, and Ru.

9. A coated substrate comprising a substrate having directly coated thereon the transparent conductive oxide of claim 5.

10. A transparent conductive oxide film comprising a metal oxide A_xMO_y wherein A is selected from the group consisting of H, Li, Na, and K, x = 0-2, and M is either W or Mo.

11. A coated substrate comprising a soda lime glass substrate and the transparent conductive oxide film as claimed in claim 10, wherein the metal oxide is deposited on the soda lime glass substrate with consecutive annealing/diffusion of Na, Li and K from the glass, and/or vapor phase with incorporation/implantation of A into A_xMO_y.

12. A method of depositing a metal oxide film by atmospheric pressure chemical vapor deposition on a substrate, comprising the step of exposing the heated substrate to a vapor including at least one dopant having an ionic size that approximates a size of host ions in an oxide lattice in the metal oxide.

13. The method as claimed in claim 12, wherein the ionic size of said dopant is between approximately 0.60Å and 0.80Å.

14. The method as claimed in claim 12, wherein said metal oxide is selected from the group consisting of $Zn^{2+}O$, $Sn^{4+}O_2$, $Ge^{4+}O_2$, $Zr^{4+}O_2$, $Ti^{4+}O_2$, $Ga^{3+}{}_2O_3$, and mixtures thereof, and wherein said at least one dopant is selected from the group consisting of Sn^{4+}, Bi^{5+}, Ta^{5+}, Hf^{4+}, Mo^{6+}, Te^{6+}, Nb^{5+} and mixtures thereof.

15. A method of depositing a metal oxide film by atmospheric pressure chemical vapor deposition on a substrate, comprising the step of exposing the heated substrate to a vapor containing chemical precursors to deposit at least one metal oxide wherein said metal oxide is rutile MO_2, and M is selected from the group consisting of Ti, V, Cr, Mo, Ru and mixtures thereof.

16. The method of claim 15 wherein multiple metal oxide films are deposited by atmospheric pressure chemical vapor deposition, wherein said multiple films comprise $M'O_2/M''O_2$ bilayers or $M'O_2/M''O_2/M'''^{1}O_2$, sandwich structures wherein M', M'' and M''' are the same or different, wherein said $M'O_2$ film layer comprises SnO_2 or other metal oxide capable of stabilizing the rutile MO_2 film.

17. The method of claim 15 wherein said metal oxide is $Sn_xM_{1-x}O_2$, where M is selected from the group consisting of Ti, V, Cr, Mo, and Ru.

18. A method of depositing metal oxide films by atmospheric pressure chemical vapor deposition on a substrate, comprising the step of exposing the heated substrate to a vapor containing chemical precursors to deposit at least one metal oxide, wherein said metal oxide is A_xMO_y wherein A is selected from the group consisting of H, Li, Na, and K, x = 0-2, and M is either W or Mo.